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EXAMINER	
ZIMMERMAN, JOHN J	

ART UNIT	PAPER NUMBER
1775	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/734,812	JARDINE, PETER A.	
	Examiner	Art Unit	
	John J. Zimmerman	1775	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *1/4/06 (RCE)*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

FOURTH OFFICE ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on January 4, 2006 has been entered.

Amendments

2. This Fourth Office Action is in response to the Amendment received January 4, 2006.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 1-21 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claims contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which

it is most nearly connected, to make and/or use the invention. In addition, the specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to practice the invention commensurate in scope with these claims. The Jardine affidavit, received December 9, 2004, states:

> By multiplying the multitude of different compositions and the variety of different percentages of each component metal, the number of shape memory alloy compositions to try becomes infinite. Furthermore, as stated in the specification, processing conditions, such as specific ranges of target temperature, processing temperatures of the wafer, and vacuum pressures during sputter deposition are needed to make two-way shape memory effect devices. Thus, even if it is obvious to try other shape memory alloys, besides Ni:Ti, the infinite variety of shape memory alloys, percentages of component metal, and combinations of processing conditions requires undue experimentation by a routiner in the art. As the references that teach two-way shape memory devices are limited only to Ni:Ti, and alloys thereof, as an operable system, a person of ordinary skill in the art would not have sufficient expectations of success in developing new two-way shape memory effect processes with new alloys without undue experimentation. In addition, the equipment required to prepare a Ni:Ti thin-film, two-way shape memory device is very expensive and must be substantially customized to allow for controlling the important processing conditions. Furthermore, each experiment is a complicated and time-consuming task that takes laboratory time and talented technicians to prepare the targets, substrates and high vacuum chamber, sputter deposit the device under the correct processing conditions, further processing of the sample to etch at least a portion of the thin film from the substrate, preparing a method of heating the thin film or activating the shape memory effect in some other manner, and verifying that shape memory effect, if any, is repeatable and useful. Thus, undue experimentation would be necessary to determine the specific shape memory alloys and processing conditions disclosed and claimed in the above-referenced application.
>
> Furthermore, each new alloy system requires the use of a different combination of target temperature, processing temperature of the wafer, distance from the target to the wafer and vacuum pressure ranges during processing in order to successfully manufacture two-way shape memory alloy devices, requiring months of work. This depends not only on the base alloy, but also on the element or elements chosen fox X in ternary and higher order alloys, greatly increasing the complexity. Development of new shape memory alloys for two-way shape memory effect devices requires tireless effort and experimentation to synthesize and characterize materials in the correct processing range to produce practical two-way shape memory effect devices. Ternary and higher order alloys require

> even more work in selecting the compositional ranges for the higher order elements.
>
> The nearly limitless choice of alloys, chemistries and processing conditions makes selection of the right alloy constituents and process variables an exceedingly difficult task for even an expert in the field, which has necessitated research, including experimentation and calculations, to determine the desired ranges of the various processing variables.

5. The examiner notes that the majority of the pending claims in this application are simply drawn to any shape "memory alloy other than a Ni:Ti-based alloy". It appears clear from the Jardine affidavit that claims of this breadth cannot be enabled since multiplying the multitude of different compositions and the variety of different percentages of each component metal, the number of shape memory alloy compositions to try becomes infinite and requires undue experimentation in order to determine the specific shape memory alloys and processing conditions. From the Jardine affidavit it appears clear that without disclosure of particular two-way shape memory compositions and the specific processing conditions that are appropriate to those particular compositions, there would be no enablement without undue experimentation. A review of the applicant's disclosure, however, shows that the applicant's disclosure fails to disclose processing conditions for two-way shape memory compositions of the claimed breadth. Indeed, judging from the Jardine affidavit standard, the applicant's disclosure appears to fail to show processing conditions sufficient to enable any two-way shape memory effect compositions other than Ni:Ti systems. Applicant's specification simply supplies long lists of elements (e.g. see paragraphs [0069]-[0070]) that could be used in forming two-way shape memory alloys. No processing conditions for specific alloys of specific alloy composition ratios are supplied. Even pending claims which recite specified generic base alloy systems (e.g. see claims 4-8 and 20)

allow for higher order alloys based thereon and the Jardine affidavit clearly establishes that disclosures of two-way shape memory alloys in this manner requires undue experimentation and thus are not enabled. In view of the above, the pending claims are not enabled by the disclosure.

6. Claims having the current limitations but further directed specifically to an AuCd system and/or an additional element to form a ternary shape memory alloy using hydrogen, copper, silver, zinc or mercury may be considered enabled should applicant show (e.g. 132 declaration) that the disclosed process parameters in the specification (e.g. of a base pressure which may be greater than 10^{-8} Torr, a distance between the target which may be up to 6 inches, a target temperature during deposition between 150°C to 400°C, the substrate temperature maintained between one-third to two-thirds of the alloy melting temperature, vacuum pressure during sputter deposition in the range of 9×10^{-4} Torr to 1×10^{-2} Torr) are complete and sufficient guidance to enable one of ordinary skill in the art at the time the invention was made to manufacture these specific two-way shape memory alloy systems according the claimed invention without undue experimentation.

7. Claims having the current limitations but further directed specifically to iron manganese silicon quaternary and/or higher order alloy wherein additional alloying elements are selected from hydrogen, boron, carbon, magnesium, aluminum, silicon, phosphorous, sulfur, calcium, scandium, titanium, vanadium, chromium, nickel, copper, zinc, selenium, strontium, yttrium, zirconium, niobium, molybdenum, ruthenium, rhodium, palladium, silver, cadmium, tin, antimony, tellurium, barium, lanthanum, hafnium, tantalum, tungsten, rhenium, osmium, iridium,

platinum, gold, lead, bismuth, polonium, cerium, praseodymium, neodymium, samarium, europium, gadolinium, terbium, ytterbium, lutetium, thorium, protactinium, and uranium, may be considered enabled should applicant show (e.g. 132 declaration) that the disclosed process parameters in the specification (e.g. a target temperature during deposition of at least 770°C, the process temperature of the substrate in the range from one-third to two-thirds of the quaternary or higher order alloy melting temperature, vacuum pressure during processing in the range of 9 x 10^{-4} Torr to 1 x 10^{-2} Torr in an inert gas used to generate plasma) are complete and sufficient guidance to enable one of ordinary skill in the art at the time the invention was made to manufacture these specific two-way shape memory alloy systems according the claimed invention without undue experimentation.

8. Claims having the current limitations but further directed specifically to one of copper zinc aluminum and copper nickel aluminum alloys and/or ternary, quaternary or higher order alloy wherein additional alloying elements are selected from hydrogen, boron, carbon, magnesium, aluminum, silicon, phosphorous, sulfur, calcium, scandium, titanium, vanadium, chromium, nickel, copper, zinc, selenium, strontium, yttrium, zirconium, niobium, molybdenum, ruthenium, rhodium, palladium, silver, cadmium, tin, antimony, tellurium, barium, lanthanum, hafnium, tantalum, tungsten, rhenium, osmium, iridium, platinum, gold, lead, bismuth, polonium, cerium, praseodymium, neodymium, samarium, europium, gadolinium, terbium, ytterbium, lutetium, thorium, protactinium, and uranium, may be considered enabled should applicant show (e.g. 132 declaration) that the disclosed process parameters in the specification (e.g. a target temperature during deposition of at least 350°C, the process temperature of the

substrate in the range of about 190°C to 400°C, vacuum pressure during processing in the range of 9×10^{-4} Torr to 1×10^{-2} Torr using an inert gas used to generate plasma, a base pressure during purging of no greater than 10^{-6} Torr) are complete and sufficient guidance to enable one of ordinary skill in the art at the time the invention was made to manufacture these specific two-way shape memory alloy systems according the claimed invention without undue experimentation.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.
>
> The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

10. Claims 15 is rejected under 35 U.S.C. 102(e) as being anticipated by Hill (U.S. Patent 6,775,046).

11. Hill discloses forming two-way shape memory alloy films in which the film can be made while varying the alloy temperature during sputtering so that the deposited article has a compositional gradient (e.g. see column 4, lines 36-49; column 6, line 47 - column 7, line 35). Hill discloses that alloys of titanium and nickel can be used (e.g. see column 2, lines 32-49). Regarding the claim recitation of an "actuator", the film of Hill has all the structural requirement to be an "actuator". Regarding the claim recitation of a three-dimensional shape, the shapes of Hill may be three-dimensional (e.g. see paragraph spanning columns 10 and 11). Regarding process language in the article claim (e.g. "prior to any deformation processing of the film"), when there is a substantially similar product, as in the applied prior art, the burden of proof is shifted to the applicant to establish that their product is patentably distinct not the examiner to show that the same process of making, see *In re Brown*, 173 U.S.P.Q 685, and *In re Fessmann*, 180 U.S.P.Q. 324.

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

13. Claims 1-16 and 18-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ho (U.S. Publication No. 2002/0043456) in view of Bement (U.S. Publication 2002/0114108).

14. Ho (different inventive entity and published more than one year prior to the filing date of this pending application) discloses forming two-way shape memory alloy films in which the film can be made while varying the target alloy temperature during sputtering so that the deposited article has a compositional gradient (e.g. see claims 1-2). Ho also discloses processing parameters (e.g. vacuum pressure, use of argon) for sputtering two-way shape memory alloy films (e.g. see paragraphs [0059]-[0060]; Tables I-V) and how they affect the final product. Ho discloses that different three-dimensional actuator shapes can be made (e.g. paragraph [0080]; Figure 33).). Regarding process language in the article claim (e.g. "prior to any deformation processing of the film"), when there is a substantially similar product, as in the applied prior art, the burden of proof is shifted to the applicant to establish that their product is patentably distinct not the examiner to show that the same process of making, see *In re Brown*, 173 U.S.P.Q 685, and *In re Fessmann*, 180 U.S.P.Q. 324. Although Ho may not disclose all the possible shapes that an actuator may have, it would have been obvious to one of ordinary skill in the art at the time the invention was made that any actuator shape could be made by Ho's process. Regarding claims reciting a removable scaffold structure, the substrate upon which the film of Ho is sputtered qualifies as such a structure. Ho may differ from the pending claims in that Ho may not disclose that shape memory alloys other than titanium-nickel alloys can be used for his compositionally graded sputtered two-way shape memory films. Ho discloses shape memory alloy compositions in the art, but does not specifically mention the claimed gold-cadmium,

copper-zinc-aluminum and copper-nickel-aluminum compositions. On this issue, Bement is cited simply to show that gold-cadmium, copper-zinc-aluminum and copper-nickel-aluminum shape memory alloy compositions are conventional shape memory alloy compositions in the art and also that it is well understood in the art that these alloys can be formed by sputtering processes (e.g. see paragraph [0026]). In view of Bement, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use gold-cadmium, copper-zinc-aluminum and copper-nickel-aluminum shape memory alloy compositions in Ho's process because Bement shows these shape memory alloy compositions are conventional in the art and it would have been obvious to one of ordinary skill in the art at the time the invention was made that applying other known shape memory alloy compositions to Ho's process would result in a broader range of actuator materials and thus a broader range of possible actuator properties. In view of Ho's disclosure of the processing parameters involved in sputtering two-way shape memory alloy films, it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the sputtering process parameters for best results for each particular chosen composition.

15. Claims 1-16 and 18-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ho (Sputter Deposition of NiTi Thin Film Exhibiting the SME at Room Temperatures, Proceedings of the Symposium 1998 ASME International Mechanical Engineering Congress and Exposition, Nashville TN, November 14-19, 1999) in view of Bement (U.S. Publication 2002/0114108).

16. Ho (different inventive entity and published more than one year prior to the filing date of this pending application) discloses forming two-way shape memory alloy films in which the film can be made while varying the target alloy temperature during sputtering so that the deposited article has a compositional gradient (e.g. see abstract). Ho also discloses processing parameters (e.g. vacuum pressure, use of argon) for sputtering two-way shape memory alloy films (e.g. see entire document and figures) and how they affect the final product. Ho discloses that different three-dimensional actuator shapes can be made (e.g. see Figure 14). Although Ho may not disclose all the possible shapes that an actuator may have, it would have been obvious to one of ordinary skill in the art at the time the invention was made that any actuator shape could be made by Ho's process. Regarding claims reciting a removable scaffold structure, the substrate upon which the film of Ho is sputtered qualifies as such a structure.). Regarding process language in the article claim (e.g. "prior to any deformation processing of the film"), when there is a substantially similar product, as in the applied prior art, the burden of proof is shifted to the applicant to establish that their product is patentably distinct not the examiner to show that the same process of making, see *In re Brown*, 173 U.S.P.Q 685, and *In re Fessmann*, 180 U.S.P.Q. 324. Ho may differ from the pending claims in that Ho may not disclose that shape memory alloys other than titanium-nickel alloys can be used for his compositionally graded sputtered two-way shape memory films. Ho discloses shape memory alloy compositions in the art, but does not specifically mention the claimed gold-cadmium, copper-zinc-aluminum and copper-nickel-aluminum compositions. On this issue, Bement is cited simply to show that gold-cadmium, copper-zinc-aluminum and copper-nickel-aluminum shape memory alloy compositions are conventional shape memory alloy compositions in the art and also that it is well

understood in the art that these alloys can be formed by sputtering processes (e.g. see paragraph [0026]). In view of Bement, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use gold-cadmium, copper-zinc-aluminum and copper-nickel-aluminum shape memory alloy compositions in Ho's process because Bement shows these shape memory alloy compositions are conventional in the art and it would have been obvious to one of ordinary skill in the art at the time the invention was made that applying other known shape memory alloy compositions to Ho's process would result in a broader range of actuator materials and thus a broader range of possible actuator properties. In view of Ho's disclosure of the processing parameters involved in sputtering two-way shape memory alloy films, it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the sputtering process parameters for best results for each particular chosen composition.

17. Claims 1-16 and 18-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ho (Sputter Deposition of NiTi Thin Film Shape Memory Alloy Using a Heated Target, Thin Solid Films 370, July 17, 2000, pp. 18-29) in view of Bement (U.S. Publication 2002/0114108).

18. Ho (different inventive entity and published more than one year prior to the filing date of this pending application) discloses forming two-way shape memory alloy films in which the film can be made while varying the target alloy temperature during sputtering so that the deposited article has a compositional gradient (e.g. see abstract). Ho also discloses processing parameters (e.g. vacuum pressure, use of argon) for sputtering two-way shape memory alloy films (e.g. entire article) and how they affect the final product. Although Ho may not disclose all the

possible shapes that the films may have, it would have been obvious to one of ordinary skill in the art at the time the invention was made that any functional shape memory configuration could be made by Ho's process. Regarding claims reciting a removable scaffold structure, the substrate upon which the film of Ho is sputtered qualifies as such a structure.). Regarding process language in the article claim (e.g. "prior to any deformation processing of the film"), when there is a substantially similar product, as in the applied prior art, the burden of proof is shifted to the applicant to establish that their product is patentably distinct not the examiner to show that the same process of making, see *In re Brown*, 173 U.S.P.Q 685, and *In re Fessmann*, 180 U.S.P.Q. 324. Ho may differ from the pending claims in that Ho may not disclose that shape memory alloys other than titanium-nickel alloys can be used for his compositionally graded sputtered two-way shape memory films. Ho discloses shape memory alloy compositions in the art, but does not specifically mention the claimed gold-cadmium, copper-zinc-aluminum and copper-nickel-aluminum compositions. On this issue, Bement is cited simply to show that gold-cadmium, copper-zinc-aluminum and copper-nickel-aluminum shape memory alloy compositions are conventional shape memory alloy compositions in the art and also that it is well understood in the art that these alloys can be formed by sputtering processes (e.g. see paragraph [0026]). In view of Bement, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use gold-cadmium, copper-zinc-aluminum and copper-nickel-aluminum shape memory alloy compositions in Ho's process because Bement shows these shape memory alloy compositions are conventional in the art and it would have been obvious to one of ordinary skill in the art at the time the invention was made that applying other known shape memory alloy compositions to Ho's process would result in a broader range of actuator materials

and thus a broader range of possible actuator properties. In view of Ho's disclosure of the processing parameters involved in sputtering two-way shape memory alloy films, it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the sputtering process parameters for best results for each particular chosen composition.

Response to Arguments

19. Applicant's arguments filed January 4, 2006 have been fully considered but they are not persuasive with regards to the pending rejections. As noted above, claims having the current limitations and directed to specific two-way shape memory alloy systems may be considered enabled if applicant shows (e.g. by 132 declaration) that the original disclosure provides complete and sufficient guidance to enable one of ordinary skill in the art at the time the invention was made to manufacture these specific two-way shape memory alloy systems and/or their higher order alloys according the claimed invention without undue experimentation. Although the applicant's original disclosure suggests that specific two-way shape memory alloys and their higher order alloys can be manufactured using disclosed parameters, the Jardine Affidavit (received January 4, 2006) suggests that the issue of undue experimentation comes into play when manufacturing different two-way shape memory alloy films and particularly when manufacturing their higher order alloys. In view of the Jardine Affidavit, further clarification on this issue (e.g. by 132 declaration) is needed in order to determine the scope of the claims for which the original disclosure is enabled.

20. In addressing the gold-cadmium, copper-zinc-aluminum and copper-nickel-aluminum shape memory alloys disclosed by the Bement reference, applicant argues that as presented in the Jardine Affidavit "there are many alloys systems that exhibit one-way shape memory alloy, but the processing conditions for producing two-way shape memory alloys are not known to a person of ordinary skill in the art without undue experimentation" (e.g. see page 7 of applicant's response received January 4, 2006). The examiner notes that the majority of the applicant's pending claims do not require any specific alloy system other than any two-way shape memory alloy system containing "substantially no titanium", but applicant also argues that the processing conditions disclosed in the applicant's specification are all that is needed for one of ordinary skill in the art to manufacture two-way shape memory alloys commensurate with the scope of these claims without undue experimentation. Thus it is not clear from applicant's arguments whether producing a two-way shape memory alloy, without specific processing parameters for that particular alloy would (or would not) result in undue experimentation for one of ordinary skill in the art. The Jardine declaration (received December 9, 2004) appears to clearly suggest that producing a two-way shape memory alloy, without specific processing parameters for that specific alloy, would require undue experimentation. The applicant's arguments in addressing the applied prior art references appear to suggest that producing a two-way shape memory alloy, without specific processing parameters for those particular alloys, would require undue experimentation. The applicant's arguments in addressing the enablement rejection under 35 U.S.C. 112, first paragraph, appear to suggest that producing any substantially non-titanium containing two-way shape memory alloys using the processing parameters disclosed in applicant's disclosure (which only address some specific shape memory alloy systems) would not

require undue experimentation. In view of the inconsistencies in applicant's position, it has been necessary to maintain, throughout prosecution, both the enablement and the art based rejections until these inconsistencies are resolved.

21. As noted above, claims having the current limitations but further directed specifically to an AuCd system and/or an additional element to form a ternary shape memory alloy using hydrogen, copper, silver, zinc or mercury may be considered *enabled* should applicant show (e.g. 132 declaration) that the disclosed process parameters in the specification (e.g. of a base pressure which may be greater than 10^{-8} Torr, a distance between the target which may be up to 6 inches, a target temperature during deposition between 150°C to 400°C, the substrate temperature maintained between one-third to two-thirds of the alloy melting temperature, vacuum pressure during sputter deposition in the range of 9×10^{-4} Torr to 1×10^{-2} Torr) are complete and sufficient guidance to enable one of ordinary skill in the art at the time the invention was made to manufacture these specific two-way shape memory alloy systems according the claimed invention without undue experimentation.

22. As noted above, claims having the current limitations but further directed specifically to iron manganese silicon quaternary and/or higher order alloy wherein additional alloying elements are selected from hydrogen, boron, carbon, magnesium, aluminum, silicon, phosphorous, sulfur, calcium, scandium, titanium, vanadium, chromium, nickel, copper, zinc, selenium, strontium, yttrium, zirconium, niobium, molybdenum, ruthenium, rhodium, palladium, silver, cadmium, tin, antimony, tellurium, barium, lanthanum, hafnium, tantalum, tungsten,

rhenium, osmium, iridium, platinum, gold, lead, bismuth, polonium, cerium, praseodymium, neodymium, samarium, europium, gadolinium, terbium, ytterbium, lutetium, thorium, protactinium, and uranium, may be considered *enabled* should applicant show (e.g. 132 declaration) that the disclosed process parameters in the specification (e.g. a target temperature during deposition of at least 770°C, the process temperature of the substrate in the range from one-third to two-thirds of the quaternary or higher order alloy melting temperature, vacuum pressure during processing in the range of 9×10^{-4} Torr to 1×10^{-2} Torr in an inert gas used to generate plasma) are complete and sufficient guidance to enable one of ordinary skill in the art at the time the invention was made to manufacture these specific two-way shape memory alloy systems according the claimed invention without undue experimentation.

23. As noted above, claims having the current limitations but further directed specifically to one of copper zinc aluminum and copper nickel aluminum alloys and/or ternary, quaternary or higher order alloy wherein additional alloying elements are selected from hydrogen, boron, carbon, magnesium, aluminum, silicon, phosphorous, sulfur, calcium, scandium, titanium, vanadium, chromium, nickel, copper, zinc, selenium, strontium, yttrium, zirconium, niobium, molybdenum, ruthenium, rhodium, palladium, silver, cadmium, tin, antimony, tellurium, barium, lanthanum, hafnium, tantalum, tungsten, rhenium, osmium, iridium, platinum, gold, lead, bismuth, polonium, cerium, praseodymium, neodymium, samarium, europium, gadolinium, terbium, ytterbium, lutetium, thorium, protactinium, and uranium, may be considered *enabled* should applicant show (e.g. 132 declaration) that the disclosed process parameters in the specification (e.g. a target temperature during deposition of at least 350°C, the process

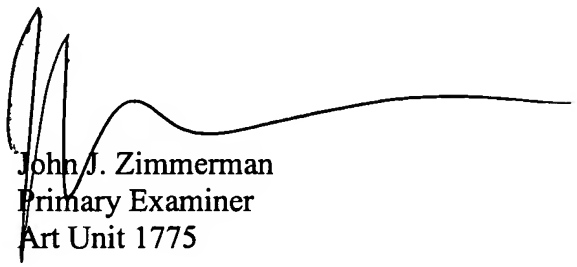
temperature of the substrate in the range of about 190°C to 400°C, vacuum pressure during processing in the range of 9×10^{-4} Torr to 1×10^{-2} Torr using an inert gas used to generate plasma, a base pressure during purging of no greater than 10^{-6} Torr) are complete and sufficient guidance to enable one of ordinary skill in the art at the time the invention was made to manufacture these specific two-way shape memory alloy systems according the claimed invention without undue experimentation.

24. Claims 15 remains rejected under 35 U.S.C. 102(e) as being anticipated by Hill (U.S. Patent 6,775,046). The Schetky Affidavit, received January 4, 2006, has been carefully considered. The Schetky Affidavit states that a metallurgist who works in shape memory alloys and possesses ordinary skill would know that there is no possibility of any combination of Au and Cu exhibiting the shape memory effect. In view of the Schetky Affidavit, the 102(e) rejection applying Hill to claims reciting substantially no titanium in the two-way shape memory alloy has been withdrawn. Pending claim 15, however, allows for titanium containing shape memory alloys and Hill clearly discloses forming two-way shape memory alloy titanium containing films in which the films can be made while varying the alloy temperature during sputtering so that the deposited article has a compositional gradient (e.g. see column 4, lines 36-49; column 6, line 47 - column 7, line 35). In addition, in view of the statements in the Schetky Affidavit, Hill (U.S. Patent 6,775,046) has been removed from the rejections based on 35 U.S.C. 103(a).

Conclusion

25. Any inquiry concerning this communication or earlier communications from the examiner should be directed to John J. Zimmerman whose telephone number is (571) 272-1547. The examiner can normally be reached on 8:30am-5:00pm, M-F. Supervisor Deborah Jones can be reached on (571) 272-1535. The fax phone number for the organization where this application or proceeding is assigned is (571)-273-8300.

26. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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Art Unit 1775

jjz
February 3, 2006